*Ranunculus auricomus*: pollen-grains round and smooth, and $\frac{1}{800}$th of an inch in diameter.

*R. acris*: pollen-grains round and smooth, and $\frac{1}{840}$th of an inch in diameter.

*R. repens*: pollen-grains round and smooth, and $\frac{1}{666}$th of an inch in diameter.

*R. bulbosus*: pollen-grains round and smooth, and $\frac{1}{727}$th of an inch in diameter.

*R. hirsutus*: pollen-grains smoothish, with three depressed scars, and $\frac{1}{885}$th of an inch in diameter.

*R. arvensis*: pollen-grains round, rough, and so much larger than those of the other species as to measure $\frac{1}{440}$th of an inch in diameter. The roughness remains when the pollen-grains are treated either with dilute acids or water.

Hence the roughness and comparatively large size of the pollen-grains of *R. arvensis* are very evident, and this curious difference is certainly constant in our plants. It may be easily seen under a magnifying power of fifty diameters. When much more magnified, some inequalities may appear on the surface of the pollen-grains of the five preceding species. An examination of the pollen of *R. parviflorus* would be interesting.

## *On the Feathers of* Dinornis robustus, *Owen.*

By W. S. Dallas, F.L.S., Keeper of York Museum.

The acquisition by the Yorkshire Philosophical Society of a specimen of *Dinornis robustus*, Owen, in so perfect a state of preservation that it retains even portions of the muscular and integumentary systems, enables me to describe at least a part of the structure of the feathery covering of this remarkable bird, and thus to throw some further light upon its affinities among birds with which we are acquainted in the living state. The general condition of the skeleton was described by Mr. Allis in a paper read before the Linnean Society in June last; and Professor Owen has since made use of one or two portions of it for the completion of his description of the species, in a paper communicated to this Society; but the fact of the occurrence of the feathers, however imperfect, of a bird which, as far as our information goes, has long been extinct, seems to call for some special notice.

At first sight, indeed, it would seem that the fresh condition of many parts of this skeleton, and the preservation of traces of the soft parts, might warrant us in supposing that many years have not elapsed since the bird to which it belonged wandered over the hills of Otago; but all possibility of drawing from these circumstances any conclusions as to the period of its death is set aside by the fact that other parts of the skeleton are in a state of decay which would apparently require a free exposure to the weather for many years for its production.

The portion of skin which bears the remains of feathers covered the greater part of the flat, rhombic region of the pelvis immediately above the commencement of the tail, and extended, on the left side,

beyond the ridge bounding this part of the pelvis, and for some distance down the slope of its side, where it has beneath it the aponeurotic portion of some of the great muscles of the thigh. The feather-bearing portion forms a sort of broad, irregular, transverse band across this region of the pelvis, encroached upon anteriorly by a wide semicircular notch, and posteriorly, a little to the right of the centre, by an irregular worn space exhibiting numerous perforations, indicating the former positions of feathers which have disappeared. The skin itself is rather thick and coarse. The remains of feathers occur only on that part of the skin which covered the flat back of the pelvis, in which their insertions give rise to strongly marked papillæ. The skin on the sloping left side of the pelvis bears no feathers, and presents no traces of their insertion. It appears, however, to have lost some of its outer layers, and certainly does not furnish evidence sufficient to prove the existence of a featherless space at this part, which would be opposed to Nitzsch's description of the pterylography of the *Struthionidæ*.

The feathers are all very imperfect, consisting only of the basal portions of the shaft and accessory shaft, with here and there some traces of the barbs. The latter occur most abundantly towards the left side, and especially in the feathers situated upon the left ridge, from which the specimen here figured (fig. 1) was taken. The shafts are always evidently imperfect; the longest fragment existing in the skin is only about 2 inches in length. The stem tapers gradually, the quill being the widest part and about $\frac{1}{24}$th of an inch in diameter. The quill is inserted about $\frac{3}{16}$ths of an inch into the skin, and the webs appear generally to have commenced about $\frac{1}{12}$th of an inch from the junction of the quill with the shaft. From these data it is of course impossible to form any opinion as to the original length of the feathers.

The accessory shafts are considerably smaller than the main shafts, but still of sufficient size to constitute an important portion of the plumage. The longest accessory shaft that I have been able to find measures $1\frac{1}{2}$ inch in length, and is imperfect; there is little doubt that the accessory shafts were both shorter and more slender than the true feathers.

The shaft is somewhat convex above, and marked with a fine longitudinal furrow beneath. It is of a brown colour beneath, but pale horn-colour above, probably from exposure to external influences. The accessory shaft is of a pale horn-colour, and appears to be nearly cylindrical.

The structure of the web is somewhat different from that which occurs in the Emu and the Cassowary. Towards the base of the shaft the barbs spring in groups of four or five together from nearly the same spot, and thus this part of the web assumes a tufted aspect. As we advance towards the apex this arrangement speedily ceases; the number of barbs springing from the shaft gradually diminishes, until each side bears only a single series of these appendages. The barbs consist of slender, flattened fibres, bearing long, silky, and very delicate barbules, without any trace of barbicels, but presenting a di-

stinctly beaded appearance when examined by a simple lens. Under the microscope, with a moderate power, this beaded aspect is lost, and the barbule appears merely divided by faint transverse partitions into a series of cells, some of which, towards the apex, exhibit small tooth-like projections representing the rudiments of barbicels (fig. 3). All the barbs remaining on the feathers appear to be imperfect.

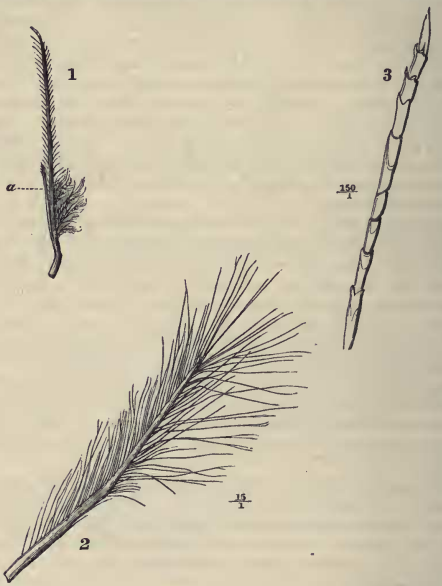


Fig. 1. The basal portion of a feather detached from the skin, of the natural size: *a*. The accessory shaft.
2. Part of a barb with the barbules; magnified 15 diameters.
3. Apical portion of a barbule; magnified 150 diameters.

The barbs of the accessory plume are of the same general structure as those on the main shaft, but they appear to form a single series on each side from the base.

The barbs nearest the base of the feather, both in the main web and the accessory plume, are destitute of barbules for some distance from their base; but this distance gradually decreases until the barb is furnished with barbules throughout its whole length.

It is evidently impossible to determine from these mere fragments of feathers what was the precise structure of those organs when perfect; we cannot even decide whether the basal barbs possessed the

hair-like tips characteristic of those of the Emu and Cassowary, and still less whether the apical portion of the feather supported simple barbs such as occupy that position in those birds. The only fact of importance, indeed, that I can hope to make known by this paper is that the *Dinornithes* undoubtedly possessed a large accessory plume, thus adding another proof of their relationship to the green-egged Emus and Cassowaries existing in the Australian region, and of their difference from the white-egged group of Struthiones represented in Africa and South America.—*Proc. Zool. Soc.* March 14, 1865.

*On the Metamorphoses undergone by certain Fishes before acquiring the Adult Form.* By Professor Agassiz.

I have lately observed in Fishes metamorphoses as considerable as those known to take place in the Amphibia. Now that pisciculture is followed with so much success and on so large a scale, it is surprising that this fact has not been long since observed; but this may perhaps be attributed to the circumstance that these metamorphoses usually commence after the hatching of the young, at a period when they die rapidly, if kept in captivity. At this age, moreover, they are for the most part too small to be conveniently studied in their natural element. Nevertheless this is the most important period of their growth, if we wish to study their natural affinities. I intend shortly to show how certain small Fishes, at first resembling Gadoids or Blennioids, pass gradually to the type of the Labroids and Lophioids. I shall also be able to show how certain embryos resembling the tadpoles of the Frog or Toad, gradually acquire the form of Cyprinodonts,—how certain Apodal Fishes become transformed into Jugular and Abdominal Fishes, and certain Malacopterygians into Acanthopterygians, and, lastly, how we may found a natural classification of Fishes upon the correspondence existing between their embryonic development and the complication of their structure in the adult state.

Quite recently I have discovered that the metamorphoses of certain members of the Scomberoid family are perhaps still more unexpected than any of those which I have previously observed. Every ichthyologist knows the characters of the Dory (*Zeus faber*), and the peculiarities which connect this fish with the family of the Scomberoids. Another less-known but very curious fish, *Argyropelecus hemigymnus* (Cocco), which likewise inhabits the Mediterranean, has been generally referred to the Salmon family, or placed with the Salmons as a subfamily. Systematic authors have generally regarded the Scomberoids and the Salmons as very different fishes, the former being referred to the Acanthopterygii and the latter to the Malacopterygii. Nevertheless *Argyropelecus hemigymnus* is neither more nor less than the young state of *Zeus faber*.

I expect that all ichthyologists will reject this assertion as erroneous. Nevertheless nothing can be more true; and therefore, instead of seeking to prove it by long arguments, I shall, for the present, merely request my *confrères* to procure small specimens of the Dory (of 8 to 10 centimètres in length), and to compare them with authentic specimens of *Argyropelecus*, feeling certain that they will admit the